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DURATIONS OF DUTCH JOB VACANCIES

BY

J.C. VAN OURS*

1 INTRODUCTION

In The Netherlands the Central Bureau of Statistics collects information about job vacancies using an employers' survey. From this survey of some 20,000 firms which has been conducted almost yearly since 1980, it appears that the number of job vacancies has decreased from 52,100 in October 1980 to 17,600 in October 1982. As shown in Table 1 the number of job vacancies increased since then to 70,200 in January 1987, while in January 1988 there were 64,500.

Unemployment in The Netherlands has risen sharply since the beginning of the eighties. In 1980 325,000 persons were registered as unemployed, in 1984 there were 820,000. Since then unemployment declined to a level of about 680,000 in 1988, which is about 14% of the labour force. A characteristic of Dutch unemployment is the large share of long term unemployed. About 250,000 persons are registered unemployed for more than 2 years.

There is discussion about the actual number of unemployed in The Netherlands. According to a recent labour force survey of the Central Bureau of Statistics actual unemployment in 1988 was some 40% lower than registered unemployment. Even then however the Dutch labour market is characterized by a huge supply surplus, with which one would expect no problems on the demand side of the labour market. Employers however complain about hard-to-fill job vacancies. Of the job vacancies in January 1988 42% were considered hard-to-fill.

According to employers it is often difficult to get job vacancies filled in a satisfactory manner in spite of the huge unemployment. The search for new employees takes too much time or, to put it differently, the duration of the job vacancies is too long.

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Some general information about the duration of Dutch job vacancies is given in Table 1. As is shown in October 1980 40% of job vacancies lasted for more than 3 months. In September 1984 this was 16% and in January 1988 20%.

On average the duration of Dutch job vacancies decreased in the beginning of the eighties, to reach its lowest level in 1983/84. Since then the average duration increased again. Probably a part of both the decrease and the increase in the average duration of job vacancies is connected with the accompanying increase and decrease in unemployment. The increase in the duration of job vacancies may however also be attributed to a deterioration of the functioning of the labour market.

Hard-to-fill job vacancies and job vacancies that last too long may be an indication in the first place that a large share of the unemployed has to be considered as non-mediatory. In the second place these job vacancies may inhibit firms from using their growth potentials and force them to decrease their capital investments, both of which are damaging to the growth of employment.

Analysing the determinants of job vacancy duration may lead to valuable information about the functioning of the labour market and about the possibilities for firms to shorten the duration of their job vacancies. In this paper micro-data on durations of job vacancies are analysed using a proportional hazard model. The data used in the analysis are from a Dutch job vacancy survey conducted in two stages in the period November 1986–April 1987. In the first stage employers were asked if they had job vacancies and if so, they were questioned about these vacancies. In the second stage, about four months later, employers were asked if their job vacancies were filled in the meantime and if so, they were questioned about the characteristics of the new employees. Thus, these micro data provide much more information on the determinants of job vacancies and their duration than the survey data of the Central Bureau of Statistics do.

TABLE 1 - STOCK OF JOB VACANCIES IN THE NETHERLANDS; DISTRIBUTION OF INCOMPLETE DURATIONS^a

		Incomplete duration (months)				Number of job vacancies (• 1000)
		≤ 1	1–3	3–6	≥ 6	
October	1980	33.9	24.6	12.7	28.8	52.1
October	1981	60.5	10.3	10.7	18.5	26.8
October	1982	52.1	29.7	6.7	11.5	17.6
October	1983	56.7	26.8	7.1	9.4	23.6
September	1984	53.0	31.1	7.4	8.5	34.6
January	1986	46.8	30.4	10.4	12.4	66.2
January	1987	46.0	29.8	11.9	12.3	70.2
January	1988	46.5	33.4	9.7	10.4	64.5

a Government, education and private employment agencies are excluded from the survey

Source: Central Bureau of Statistics

The purpose of this paper is to find the determinants of job vacancy duration using different types of explanatory variables: characteristics of the employer, characteristics of the vacant job, recruitment channels and regional labour market conditions. Measuring the effects of those determinants may provide valuable insight into the functioning of the demand side of the labour market.

The rest of the paper consists of the following sections. In Section 2 labour market search studies and hazard models are briefly discussed. Furthermore job vacancy duration is modelled. In Section 3 we discuss the data and the variables used in the analysis. The likelihood functions and the estimation results are presented in Section 4. The conclusions are drawn in Section 5.

2 LABOUR MARKET SEARCH

2.1 *Search Studies and Hazard Models*

In their dynamic theory of the labour market Holt and David (1966) considered both workers' search and employers' search as important mechanisms which determine the functioning of the labour market: 'The hiring of a worker is viewed as resulting from a random search process through which a non-standard worker and a non-standard job are somehow matched to satisfy certain wage and skill criteria established by firm and worker.' In this theory understanding the determinants of both duration of unemployment spells and duration of job vacancies were viewed as equally important. In theoretical as well as empirical research following the Holt and David study, job vacancies did not receive much attention. Most of the research was about job search, especially of unemployed workers.

In the Lippman and McCall article (1976) on search theory search models for employers are hardly mentioned. After that theoretical developments and empirical research focus almost exclusively on search models for the unemployed and the duration of unemployment. See for the seminal papers Salant (1977), Lancaster (1979) and Nickell (1979) and for an overview Mortensen (1986) and Kiefer (1988). In these and other studies so-called hazard models are used estimating the probability of an unemployed person finding a job conditional to him or her being unemployed for a certain period of time. In the hazard models this conditional probability is linked to characteristics of the person involved (age, education, *etc.*), unemployment benefits, labour market conditions and so on. An important feature in the hazard models is whether or not there is a negative duration dependence. If the probability of finding a job is independent of the duration of the unemployment spell there is no duration dependence. If there is negative duration dependence, the probability that an unemployed person gets a job decreases with the duration of his or her unemployment spell. A possible explanation for this phenomenon is that long term-unemployed become stigmatized by employers.

Empirical research on duration of unemployment in The Netherlands has been done on aggregate data (Kooreman and Ridder(1983)) as well as on micro-

data (Van Opstal and Theeuwes (1986)). From these studies it appears that the occurrence of duration dependence is still undetermined. Kooreman and Ridder found that duration dependence exists for female unemployed, but not for male unemployed. Not satisfied with these results they concluded that for stronger evidence on duration dependence in further research data on individual durations of unemployment should be used. The results by Van Opstal and Theeuwes using micro-data of youth unemployment spells are however equally inconclusive. Depending on the specifications used they found negative duration dependence or a duration dependence which could not be distinguished from the so-called heterogeneity effect. This effect is caused by omitted variables and may lead to fallacious duration dependence if it is not counted for.

Though the mainstream of labour market search studies is about job search of unemployed there are some empirical studies of employers' search, for example Barron and Bishop (1985) and Barron, Bishop and Dunkelberg (1985). These studies use information from surveys in which employers were asked about the screening and interviewing activity associated with the last employee hired prior to the survey. The only studies we know of analysing job vacancy durations are Beaumont (1978) and Roper (1988).

Research on job vacancies in the Netherlands is scarce. The aggregate duration data on job vacancies collected by the Central Bureau of Statistics have been analysed by Van Ours and Ridder (1988). The data relate to incomplete durations of job vacancies disaggregated to different educational levels and educational directions, for the years 1980-1987. In this study a proportional hazard model was used from which it appears that the durations of job vacancies depend on characteristics of the vacancies and the state of the labour market. For example the average completed duration of a job vacancy requiring a worker with a lower technical education was 5.3 months in October 1980 and 1.6 months in January 1987. For a job vacancy requiring a worker with an academical technical education the average duration was 7.4 months in October 1980 and 3.0 months in January 1987. Furthermore the study showed positive duration dependence for job vacancies: the probability that a job vacancy is filled increases with the duration of that vacancy.

2.2 Modelling Job Vacancy Duration

We can analyse the duration of job vacancies using the results from the economic theory of job search. In this theory for given wage offers employers searching for new employees face a distribution of marginal products connected to job searchers (Lippman and McCall (1976) pp. 181,182). Of course productivities of job searchers are not easily determined. It is therefore assumed that employers can perform tests which reveal the true value of the job searcher's marginal product. These tests are costly in time and money and it is these costs which amongst others limit employer's search. Each time an applicant is interviewed the employer has to decide whether to accept the applicant or to

continue searching for another applicant with better qualifications. If the employer decides to continue searching he foregoes income (the difference between the wage he wants to pay and the expected value of the potential production of the rejected applicant). Moreover, as stated before, searching itself is not costless. The employer balances the costs of further search to find a better candidate against the extra profits connected to that candidate. He does this by choosing a level of productivity such that the marginal costs of another period of search is equal to the marginal income gain in this period. This productivity level is the reservation productivity of the employer. As soon as an applicant has an estimated productivity above the reservation productivity he or she is hired.

The recruitment process of the employer can be modelled in the following way. Consider a job vacancy indexed by i , during an infinitesimal short period $(t, t + dt)$. The probability that during this period an applicant reacts to this vacancy is $m_i(t)dt$. If the distribution of productivities corresponding to possible applicants is given by the distribution function $F(\cdot)$, then the probability that that job vacancy is filled during $(t, t + dt)$, given that it has lasted until moment t , is:

$$\theta_i(t)dt = m_i(t) \cdot (1 - F_i(R_i(t)))dt \quad (1)$$

where $\theta_i(t)$ is the so-called 'hazard rate' that governs the flow of job vacancies being filled and $R_i(t)$ is the reservation productivity after t periods of existence of the job vacancy.

The probability distribution of the vacancy duration is determined by the sequence of (conditional) probabilities of filling a job vacancy in a period, given that it is still open at the start of that period.

The relation between the hazard function and the distribution function G of completed job vacancies is (omitting the index i):

$$\theta(t)dt = g(t)dt / (1 - G(t)) \quad (2)$$

in which g is the corresponding probability density function of the completed job vacancy durations. Integrating (2) gives:

$$\int_0^t \theta(s)ds = -\ln(1 - G(t)) \quad (3)$$

So:

$$1 - G(t) = e^{-\int_0^t \theta(s)ds} \quad (4)$$

Combining (2) and (4) we get the standard result:

$$g(t) = \theta(t) \cdot e^{-\int_0^t \theta(s)ds} \quad (5)$$

We analyse job vacancy durations using the proportional hazard approach in which the hazard rate is the product of: a function ϕ of the explanatory variables (\mathbf{x}), a function Φ which measures the duration dependency and a function of v , the error term in which the effect of omitted variables or functional misspecification is included. Thus the hazard rate becomes:

$$\theta(t)dt = \phi(\mathbf{x}) \cdot \Phi(t) \cdot v dt \quad (6)$$

The function of the explanatory variables is defined as:

$$\phi(\mathbf{x}) = \exp(\mathbf{x}'\beta) \quad (7)$$

with β as the vector of coefficients to estimate. The explanatory variables will be discussed in Section 3.2.

For $\Phi(t)$ we use a Weibull specification:

$$\Phi(t) = \alpha \cdot t^{\alpha-1} \text{ with } \alpha > 0 \quad (8)$$

If $\alpha = 1$ there is no duration dependence, if $\alpha < 1$ there is negative, if $\alpha > 1$ there is positive duration dependence. Furthermore we assume the heterogeneity effect to have a gamma distribution with mean 1 and variance σ^2 :

$$f(v) = ((\sigma^2)^{-\sigma^{-2}} / \Gamma(\sigma^{-2})) \cdot v^{-\sigma^{-2}-1} \cdot e^{-v \cdot \sigma^{-2}} \quad (9)$$

For the proportional hazard model with a Weibull specification of the duration dependence and gamma-distributed error terms we get (see Kooreman and Ridder (1983)):

$$\theta(t) = \phi(\mathbf{x}) \cdot \alpha \cdot t^{\alpha-1} / (1 + \sigma^2 \cdot \phi(\mathbf{x}) \cdot t^\alpha) \quad (10)$$

and therefore:

$$g(t) = \phi(\mathbf{x}) \cdot \alpha \cdot t^{\alpha-1} \cdot (1 + \sigma^2 \cdot \phi(\mathbf{x}) \cdot t^\alpha)^{-\sigma^{-2}-1} \quad (11)$$

3 DATA AND VARIABLES

3.1 Data

The data used in the analysis are from a job vacancy survey of the Organisation for Strategic Labour Market Research (OSA). As in the CBS survey this survey implicitly defines a job vacancy by asking the employer:

- Do you have *at this moment* job vacancies for which you are *searching for employees* whom you want to put to work *immediately or as soon as possible*?

So it is not important whether a job is occupied or not, nor is it necessary that the employee can be put to work immediately. This broad definition leads to inconsistencies if one wants to compare the figures with unemployment data, but as a means to study employers' search behaviour the information gathered is valuable.

The sample of employers who were questioned was drawn from the database of the Dutch Chamber of Commerce, in which government and education as well as employment agencies are excluded. The sample was stratified according to employers' size and economic activity. In the original sample there were 1288 medium-sized and 625 large employers.

The job vacancy survey was conducted in two stages. In the first stage in the months November 1986–January 1987 employers were asked if they had vacancies and if so they were questioned about the characteristics of these vacancies. Of the 648 employers with job vacancies 580 cooperated in the survey. These employers answered questions about the skills they required for their job vacancies, the sort of jobs the vacancies referred to, their recruitment methods and selection procedures, the number of applicants, the elapsed duration of the job vacancies, the backgrounds of the hard-to-fill job vacancies and the chances long-term unemployed would have if they applied.

The second stage of the survey was held some four months later. Of the 580 employers of the first stage 550 cooperated in the second stage. Employers were asked if the job vacancies of the first stage had been filled and if so they were questioned about the characteristics of the new employee. Questions were posed about the skills and the labour market origin of the new employee, the completed duration of the job vacancy and so on.

Employers were questioned about single and multiple vacancies. By the latter we mean a job vacancy for which the employer is searching for more than one applicant with the same required skills.

The durations of the job vacancies are calculated using information about the date of origination and the date the vacancy was filled. These data were not reported by the day of the month, but as start, middle or end of a certain month. In our analysis we corrected for this inaccuracy (see Section 4.1).

Some 4% of the job vacancies were cancelled between the two stages of the survey. The reason may be that in these cases the employers' need for a new employee has disappeared because of a changing economic performance or reorganization of the firm. The reason for the cancellation may however also be that these vacancies were hard-to-fill and lasted too long. Since the actual reason is unknown the cancelled vacancies were excluded from the sample. This may introduce a bias in the estimates, but if so it will not be a large bias because of the small number of cancelled job vacancies.

After discarding observations for which essential variables are missing or for which the information about incompleted or completed duration is unreliable a sample of 1850 job vacancies remains, 524 of which were unfilled in the second stage. In the remaining sample there are two sorts of filled job vacancies:

those where the date the vacancy was filled is known and those of which we only know that the vacancy was filled between the two stages of the survey. For the first type of job vacancies the completed duration is known with more accuracy than for the second type. In the remaining sample there are 1100 job vacancies of the first type and 226 job vacancies of the second type.

3.2 Variables

The duration of a job vacancy may be influenced by many variables. In the analysis we distinguished 6 groups of explanatory variables. Of the effect of some of them we have *a priori* expectations. The explanatory variables are the following:

- a. *Characteristics of the employer*: Larger employers have an intensive search for new employees but also an intensive selection procedure. We are not sure as to the overall effect of employers' size on the duration of the job vacancy.
- b. *Required skills*: Job vacancies differ in educational requirements and work experience that new employees should have. The influence of educational requirements on the potential reservoir of applicants is two-fold. On the one hand higher educated workers are more scarce on the labour market than low educated workers; on the other hand higher educated workers have a higher job mobility. We expect the first effect to be dominant. So the higher the required education, the lower the potential reservoir of applicants. The same holds for the required work experience. Many of the unemployed have only recently entered the labour market and are therefore without work experience. For a good match between position and employee it is necessary to establish the correct value of the education and work experience of the applicants. This means screening and interviewing applicants. We expect that the more education and work experience required the more intensive the selection procedure. The availability of potential applicants and the length of the selection procedure will lead to job vacancies requiring more education and work experience having longer durations.
- c. *Characteristics of the vacant job*: The position connected to the job vacancy is characterized by the type of occupation and the labour conditions. Industrial occupations may have different job vacancy durations than for example service occupations, though we have no prediction of the effect of occupation on duration. Labour conditions refer to more or less unpleasant circumstances in which the job has to be done; for example, high temperatures, dust, bad smells or when for example the work is at an assembly-line or working hours are irregular. We expect these unpleasant labour conditions to make jobs less attractive inducing job vacancies with these conditions to last longer.
- d. *Recruitment methods*: An employer has different methods to recruit for a job vacancy. He can advertise, report the job vacancy to the public employment office, use informal recruitment channels or recruit within his firm. Of course the employer can use more than one recruitment channel in his search for new employees. The problem facing the employer is not to get in touch with

the largest possible number of potential applicants; rather it is to find a few applicants promising enough to be worth the investment of thorough investigation. The speed of the recruitment can be an important issue for the employer, but we do not have *a priori* expectations as to the relation between the duration of the job vacancy and the choice of recruitment channel. Another element of the recruitment is whether or not there is a multiple job vacancy, meaning that the employer may be searching for more than one applicant with the same required skills. Because more than one employee has to be recruited from the potential reservoir of applicants we expect multiple job vacancies to last longer.

e. *Regional labour market conditions*: When regional unemployment is high there is a large potential reservoir of applicants. We expect durations of job vacancies in high unemployment regions to be shorter.

f. *Duration of the job vacancy: duration dependence*: The duration of a job vacancy may influence the reservation productivity of the employer. We expect reservation productivity to decrease as it takes more time to fill the job vacancy because the duration of the vacancy may be an indication of the employers' misinterpretation of the actual labour market situation. As time goes by employers learn more about this situation and therefore decrease their reservation productivity. This means the probability that a vacancy is filled increases in time, suggesting positive duration dependence. This result has also been found by Van Ours and Ridder (1988), using aggregate job vacancy data.

A table with the definitions of the explanatory variables is given in Appendix 1, while Appendix 2 shows the means of all explanatory variables.

4 ESTIMATION AND RESULTS

4.1 *The Likelihood Function*

As stated in Section 3.1 we have information from a two-stage job-vacancy survey. We know the incomplete duration of the job vacancies from the first stage and the completed duration of the filled job vacancies from the second stage of the survey.

We have no exact information about the moment the job vacancy originated nor do we have, for the filled job vacancies, exact information of the moment they were filled. For some job vacancies we know in what month they originated or were filled, for other job vacancies we know if it was in the beginning, the middle or the end of that month that they originated or were filled. In the analysis we account for this unaccuracy as follows. If we know whether it was in the beginning, the middle or the end of the month that the job vacancy originated we suppose that it originated respectively at the fifth, the fifteenth and the twenty-fifth of that month, all with an inaccuracy of 5 days. If only the month of origination is known we suppose that it originated at the fifteenth of that month, with an inaccuracy of 15 days. The same procedure is applied to the time the job vacancies were filled.

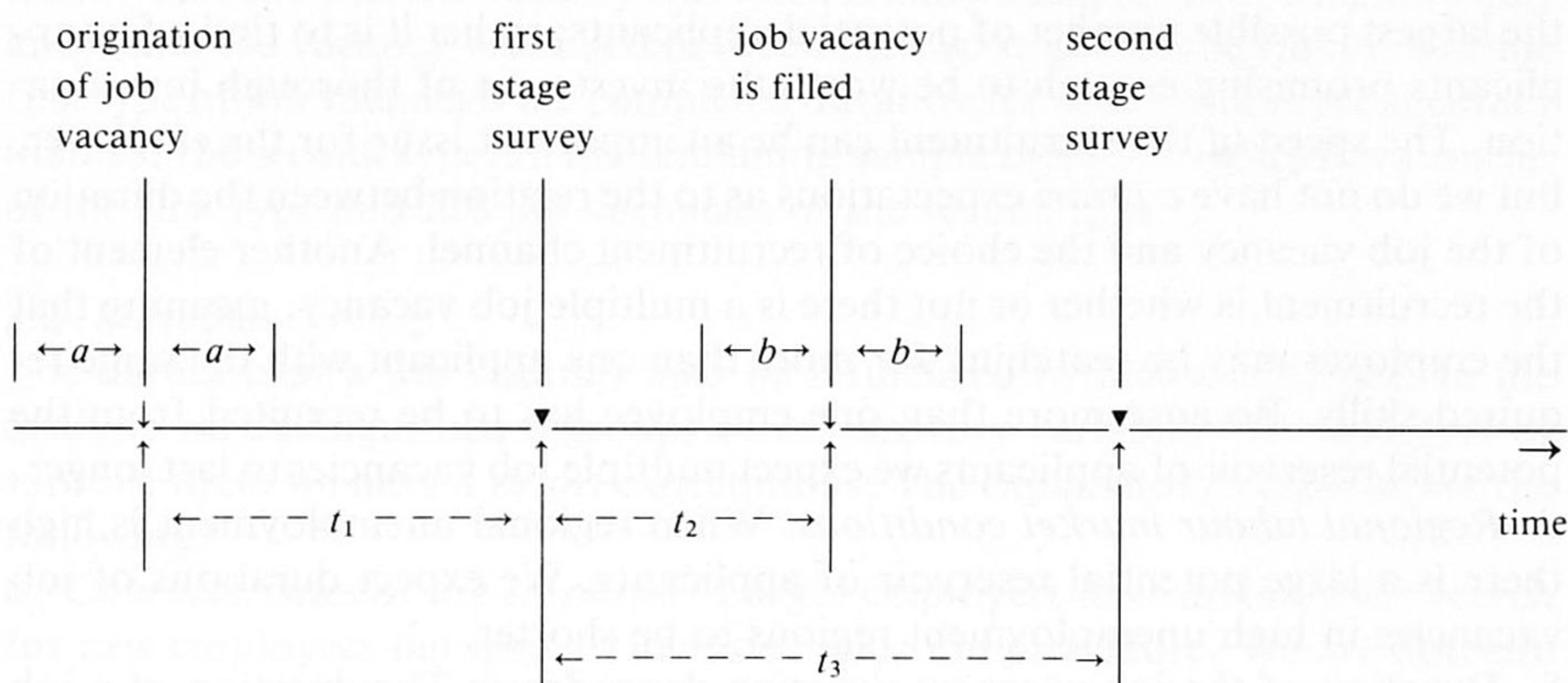


Figure 1 - Available information about job duration

A diagram with the available information about job vacancy-duration is presented in Fig. 1. We define:

t_1 = the elapsed duration of the job vacancy at the first stage of the survey

t_2 = the time between the first stage and the job vacancy being filled

t_3 = time between the two stages of the survey

a = inaccuracy of the date of origination of the job vacancy (5 or 15 days)

b = inaccuracy of the date the job vacancy was filled (5 or 15 days)

To study the stability of the coefficients of the explanatory variables we use information with respect to duration in three ways. In the first estimation we use information about incomplete vacancy durations, with probability density function (Ridder (1985)):

$$f_1(t) = (1 - G(t))/E(t) \quad (12)$$

with: $E(t)$ = the expected value of the completed duration of a job vacancy. Because of the inaccuracies in the information about the duration the likelihood becomes:

$$L_1 = \prod_{i=1}^n \frac{1 - G(t_1 - a)}{E(t)} \quad (13)$$

with: n = number of job vacancies.

In the second estimation we use information about the residual durations after the first stage of the survey, with the conditional probability density function:

$$f_2(t_2|t_1) = g(t_1 + t_2)/(1 - G(t_1)) \quad (14)$$

In this case we have to distinguish 3 types of job vacancies:

– job vacancies filled between the first and second interview with complete information about the duration:

- completed duration = $t_1 + t_2$,
 – job vacancies filled between the first and second stage of the survey with no complete information about the duration:
 $t_1 < \text{completed duration} < t_1 + t_3$,
 – job vacancies still open at the time of the second stage of the survey: completed duration $> t_1 + t_3$.

The likelihood L_2 becomes:

$$\prod_{j=1}^{fc} \frac{G(t_1 + t_2 + a + b) - G(t_1 + t_2 - a - b)}{1 - G(t_1 - a)} \prod_{k=1}^{fi} \frac{G(t_1 + t_3 - a) - G(t_1 - a)}{1 - G(t_1 - a)} \prod_{l=1}^u \frac{1 - G(t_1 + t_3 - a)}{1 - G(t_1 - a)} \quad (15)$$

where: fc = number of filled job vacancies in the sample with complete information

fi = number of filled job vacancies in the sample with incomplete information

u = number of unfilled job vacancies in the sample

Finally we use information about both incomplete and residual durations, with the joint probability density function:

$$f_3(t_1, t_2) = g(t_1 + t_2) / E(t) \quad (16)$$

in which case the likelihood L_3 becomes:

$$\prod_{j=1}^{fc} \frac{G(t_1 + t_2 + a + b) - G(t_1 + t_2 - a - b)}{E(t)} \prod_{k=1}^u \frac{G(t_1 + t_3 - a) - G(t_1 - a)}{E(t)} \prod_{l=1}^u \frac{1 - G(t_1 + t_3 - a)}{E(t)} \quad (17)$$

4.2 Estimation Results

The parameter estimates are obtained by maximizing the respective likelihoods L_1 , L_2 and L_3 using the program GRMAX written by G. Ridder. The estimation results are presented in Table 2.

The first column shows the results with $f_1(t_1)$, the second column those with $f_2(t_2|t_1)$ and the third column those with $f_3(t_1, t_2)$. We also estimate restricted versions of $f(t_1, t_2)$: in the fourth estimation σ^2 is restricted and in the fifth estimation both σ^2 and α are restricted. We will first discuss the results as a whole and then the coefficients of the explanatory variables.

From Table 2 it appears that the sum of the loglikelihoods of $f(t_1)$ and $f(t_1|t_2)$ differs substantially from the loglikelihood of $f(t_1, t_2)$. Hence we have to reject the hypothesis of overall stability of the coefficients. The largest difference is

TABLE 2 – ESTIMATION RESULTS

	$f_1(t_1)$	$f_2(t_2 t_1)$	$f_3(t_1, t_2)$
<i>UNEMPL</i>	− 0.52 (0.16)**	0.61 (0.21)**	− 0.19 (0.11)*
<i>SERVIC</i>	0.47 (0.09)**	0.62 (0.12)**	0.54 (0.08)**
<i>INDUST</i>	− 0.15 (0.09)	0.09 (0.12)	0.01 (0.01)
<i>PRIMED</i>	− 0.24 (0.11)**	− 0.19 (0.16)	− 0.20 (0.09)**
<i>EXTEDU</i>	− 0.03 (0.09)	− 0.21 (0.12)*	− 0.13 (0.07)*
<i>HIGHED</i>	− 0.41 (0.09)**	− 0.45 (0.13)**	− 0.39 (0.07)**
<i>LITEXP</i>	0.10 (0.08)	− 0.10 (0.09)	− 0.01 (0.05)
<i>MUCEXP</i>	− 0.10 (0.08)	− 0.15 (0.10)	− 0.11 (0.06)*
<i>ADVERT</i>	− 0.49 (0.07)**	− 0.07 (0.09)	− 0.26 (0.05)**
<i>EMPLOF</i>	− 0.26 (0.07)**	− 0.09 (0.08)	− 0.16 (0.05)**
<i>INTREC</i>	0.20 (0.07)**	0.10 (0.08)	0.13 (0.05)**
<i>INFORM</i>	− 0.30 (0.08)**	− 0.07 (0.10)	− 0.19 (0.06)**
<i>LABCON</i>	0.24 (0.07)**	− 0.12 (0.09)	0.04 (0.05)
<i>SIZEFI</i>	− 0.13 (0.05)**	− 0.15 (0.06)**	− 0.13 (0.04)**
<i>MULTIP</i>	− 0.04 (0.07)	− 0.15 (0.09)	− 0.10 (0.05)*
<i>CONSTA</i>	− 3.27 (0.31)**	− 4.02 (0.58)**	− 3.77 (0.31)**
α	1.65 (0.07)**	1.31 (0.15)**	1.43 (0.09)**
σ^2	— ^a	0.29 (0.14)**	0.10 (0.06)*
− Logl.	6013.8	3704.6	9839.3

Standard errors between parenthesis

**: Significant at 5% level

* : Significant at 10% level

a Because σ^2 appeared to be very small, $f(t_1)$ is estimated without heterogeneity-effect

shown by the coefficient of regional unemployment, which is significantly negative in the first estimation and significantly positive in the second estimation. The other coefficients differ only slightly, which shows that the coefficients of most explanatory variables are by and large stable. Furthermore in the first three estimations the duration dependence parameter α differs significantly from 1. There is positive duration dependence for the job vacancies in our sample. As stated before this result is in line with that of Van Ours and Ridder (1988). Apparently the reservation productivity of the employer decreases with the duration of the vacancy. The parameter σ^2 does not differ significantly from 0 in all three estimations, so there is hardly any unobserved heterogeneity

	$f_3(t_1, t_2)$ $\sigma^2 = 0$	$f_3(t_1, t_2)$ $\sigma^2 = 0$ $\alpha = 1$
<i>UNEMPL</i>	-0.05 (0.10)	0.18 (0.09)**
<i>SERVIC</i>	0.44 (0.05)**	0.39 (0.05)**
<i>INDUST</i>	-0.03 (0.06)	0.01 (0.06)
<i>PRIMED</i>	-0.21 (0.08)**	-0.14 (0.07)*
<i>EXTEDU</i>	-0.11 (0.06)*	-0.09 (0.05)
<i>HIGHED</i>	-0.35 (0.06)**	-0.28 (0.06)**
<i>LITEXP</i>	-0.01 (0.04)	-0.00 (0.04)
<i>MUCEXP</i>	-0.11 (0.05)**	-0.08 (0.05)
<i>ADVERT</i>	-0.23 (0.04)**	-0.18 (0.04)**
<i>EMPLOF</i>	-0.13 (0.04)**	-0.12 (0.04)**
<i>INTREC</i>	0.09 (0.04)**	0.09 (0.04)**
<i>INFORM</i>	-0.18 (0.05)**	-0.13 (0.05)**
<i>LABCON</i>	0.03 (0.04)	0.03 (0.04)
<i>SIZEFI</i>	-0.12 (0.03)**	-0.09 (0.03)**
<i>MULTIP</i>	-0.10 (0.05)**	-0.07 (0.04)
<i>CONSTA</i>	-2.87 (0.20)**	-2.46 (0.15)**
α	1.24 (0.03)**	-
σ^2	-	-
- Logl.	9842.7	9874.7

Standard errors between parenthesis

** : Significant at 5% level

* : Significant at 10% level

left. These conclusions are confirmed in the fourth and fifth estimations. Comparing the third with the fourth estimation we see that omitting the heterogeneity effect hardly influences the estimation results. Restricting α to 1 however leads to a substantial reduction of the loglikelihood, indicating duration dependence.

We will restrict the discussion of the coefficients of the explanatory variables to the third estimation because this is based on information on both incomplete and residual durations of the job vacancies. We see that the influence of the required education is partly in line with our expectations: job vacancies requiring higher vocational or academic schooling have the longest duration. Job vacan-

cies requiring no education however last longer than job vacancies for which education at secondary level or general schooling at extended primary level is required. The amount of working experience required seems to have no significant effect on the job vacancy durations. The same applies to job vacancies connected to unpleasant working conditions. Job vacancies for service occupations last less long than for other occupations. This may be a labour market effect because for service labour the market is less tight. Furthermore it appears from Table 2 that the choice of external recruitment channel does not influence job vacancy duration very much. Job vacancies with internal recruitment last less long, which is not surprising considering the knowledge which potential applicants have of the vacancy and the job connected to it, and the knowledge the employers have of the (potential) applicants. In the estimates the use of more than one recruitment channel increases instead of decreases job vacancy duration. This may indicate that the use of different recruitment channels is associated with job vacancies that are hard-to-fill. This in turn would imply endogeneity of the use of recruitment channels. The durations of multiple job vacancies appear to be almost the same as those of single vacancies. Finally we see that employers' size has a positive effect on the duration of job vacancies: they last longer the larger the size of the employer.

In order to give an impression of the influence of the most important explanatory variables Table 3 shows some calculated average job vacancy durations. Comparing the first with the second column we see the influence of employers' size. An increase from 50 to 500 employees increases average job

TABLE 3 - CALCULATED AVERAGE JOB VACANCY DURATIONS (IN WEEKS)^a

	Employers' size (Number of employees)	
	50	500
<i>Service occupation</i>		
Level of education:		
Primary	7.5	7.9
Extended primary	7.2	7.5
Secondary	6.6	6.8
High vocat./acad.	8.6	9.0
<i>Non-service occupation</i>		
Level of education:		
Primary	11.0	11.5
Extended primary	10.5	10.9
Secondary	9.6	10.0
High vocat./acad.	12.6	13.1

a Other specifications: No working experience required, no unpleasant working conditions, regional unemployment 15%, recruitment channel: advertisement

vacancy duration by 1-2 weeks. The first four and the second four rows give the influence of service occupations *versus* non-service occupations. Job vacancies for service occupations are on average filled 3-4 weeks quicker than those for non-service occupations. The differences between the rows show the influence of the level of required education. There is little difference between job vacancies at the primary level or vocational schooling at extended primary level. Both types of job vacancies last about 1-2 weeks longer than job vacancies for which general schooling at extended primary level or secondary level schooling is required. This last mentioned type of vacancy lasts 2-3 weeks less than job vacancies for which higher academic or vocational schooling is required.

So the calculated average job vacancy durations vary from 6-13 weeks, depending on required education, type of occupation and size of the employer.

5 CONCLUSIONS

Analysing the determinants of job vacancy duration may lead to valuable information about the functioning of the labour market and about the possibilities for firms to shorten the duration of their job vacancies. In this paper micro-data on durations of Dutch job vacancies have been analysed using a proportional hazard model with a Weibull specification of duration dependence and gamma-distributed error terms.

From a researchers' point of view the results are encouraging, because they show that it is possible to apply a hazard model to information about the duration of job vacancies. Furthermore the determinants of job vacancy duration have been located. Important determinants of job vacancy duration appear to be required education, type of occupation and employers' size. Job vacancies for which the highest education is required last longest, those at the secondary level or general schooling at extended primary level last least longest. The durations of job vacancies for service occupations are shorter than those for other occupations. The larger the employers' size the longer the job vacancies last. A striking result is that vacancies for jobs with unpleasant working conditions do not have a longer than average duration.

We also found positive duration dependence, suggesting that employers lower their hiring standards as the duration of the job vacancy increases. However only a Weibull specification of duration dependence has been investigated. Continued research using alternative specifications may lead to more detailed information concerning the nature of duration dependence. The unobserved heterogeneity was assumed to have a Gamma distribution. The estimation results show that there is hardly such an effect.

The durations of job vacancies are to a large extent determined by the characteristics of the job vacancy and the characteristics of the employer. Choice of external recruitment channel is hardly important. Recruiting intensity may be important, but we have no information on that. From a policy point of view the results are more or less disappointing, because we were not able to

come across a suitable instrument for employers to use to reduce the duration of their job vacancies and hence to enhance the functioning of the labour market. Perhaps further research which goes deeper into the characteristics of employers' search will also lead to more valuable results from a policy point of view.

APPENDICES

APPENDIX 1 - DEFINITION OF VARIABLES

The independent variables are defined as follows.

Dummy variables: equal to one if:

Occupation (Classification of Occupations 1984, CBS)

SERVIC: service, administrative, commercial occupation (CBS 3,4,5)

INDUST: industrial (blue collar) occupation (CBS 6,7)

Reference group: other occupations (CBS 0,2)

Education (minimum level required)

PRIMED: primary level

EXTEDU: extended primary level, vocational schooling

HIGHED: higher vocational or academic schooling

Reference group: education at extended primary level, general schooling and education at secondary level

Working experience (minimum level required)

LITEXP: less or equal to 2 years

MUCEXP: more than 2 years

Reference group: no working experience required

Recruitment channels (situation at the first interview)

ADVERT: advertisement

EMPLOF: reported to public employment office

INFORM: one or more informal recruitment channels

INTREC: internal recruitment used

No reference group; because firms may use more than one recruitment channel separate dummy variables are used

Labour conditions

LABCON: job with unpleasant working conditions: high temperatures, dust, bad smells, assembly-line work, irregular working hours, etc.

Reference group: job without the unpleasant working conditions mentioned above

Multiple job vacancies

MULTIP: the job vacancy refers to more than one vacant job

Reference group: the job vacancy refers to one vacant job

Continuous variables:

SIZEFI: number of employees (*1000)

UNEMPL: unemployment percentage in the province where the employer is located (*10)

APPENDIX 2 - MEANS OF VARIABLES USED IN THE ANALYSIS

	Total sample	Filled (complete information)	Filled (incomplete information)	Unfilled
<i>UNEMPL</i> (10%)	1.24	1.35	1.30	0.95
<i>SERVIC</i>	0.345	0.391	0.442	0.266
<i>INDUST</i>	0.398	0.373	0.385	0.456
<i>PRIMED</i>	0.091	0.065	0.168	0.113
<i>EXTEDU</i>	0.283	0.279	0.195	0.330
<i>HIGHED</i>	0.198	0.187	0.128	0.250
<i>LITEXP</i>	0.339	0.337	0.385	0.322
<i>MUCEXP</i>	0.292	0.300	0.195	0.317
<i>ADVERT</i>	0.646	0.611	0.743	0.679
<i>EMPLOF</i>	0.463	0.429	0.473	0.528
<i>INFORM</i>	0.800	0.824	0.784	0.822
<i>INTREC</i>	0.545	0.565	0.442	0.547
<i>LABCON</i>	0.435	0.396	0.504	0.485
<i>SIZEFI</i> (1000 empl)	0.487	0.389	0.770	0.572
<i>MULTIP</i>	0.611	0.683	0.555	0.721
t_1 (weeks)	10.4	9.3	10.4	12.8
t_2 (weeks)	–	17.1	–	–
t_3 (weeks)	17.7	17.5	18.1	17.8
NUMBER OF OBSERVATIONS	1850	1100	226	524

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Summary

DURATIONS OF DUTCH JOB VACANCIES

This paper studies the determinants of job vacancy duration in The Netherlands applying a hazard model to micro data. Important determinants of job vacancy duration appear to be required education, type of occupation and employers' size. Job vacancies for which the highest level of education is required last longest, those at the secondary level or general schooling at extended primary level last shortest. The durations of job vacancies for service occupations are shorter than those for other occupations. The duration of job vacancies increases with the size of the employer.

Furthermore vacancies for jobs with unpleasant working conditions do not have a longer than average duration.

The hazard model uses a Weibull specification of duration dependence, while the influence of unobserved variables is described with gamma-distributed error terms. Unobserved heterogeneity does not seem to be very important. Finally it appears that duration dependence is positive which may be an indication of employers lowering their hiring standards as the duration of the job vacancy increases.